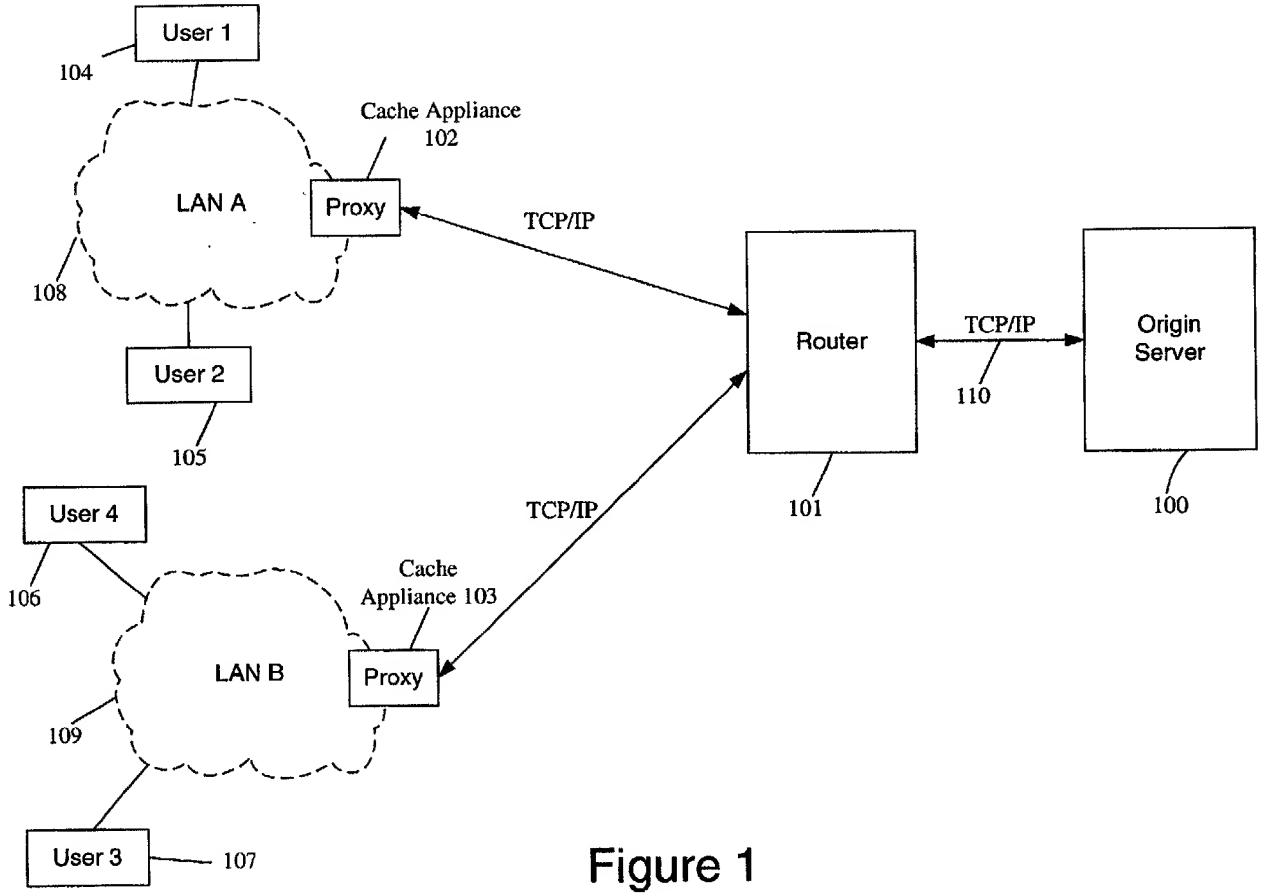

User 1
104
Cache Appliance
102
LAN A
Proxy
TCP/IP
108
User 2
105
Router
TCP/IP
Origin
Server
110
101
100
User 4
106
TCP/IP
Cache
Appliance 103
LAN B
Proxy
109
User 3
107

Figure 1

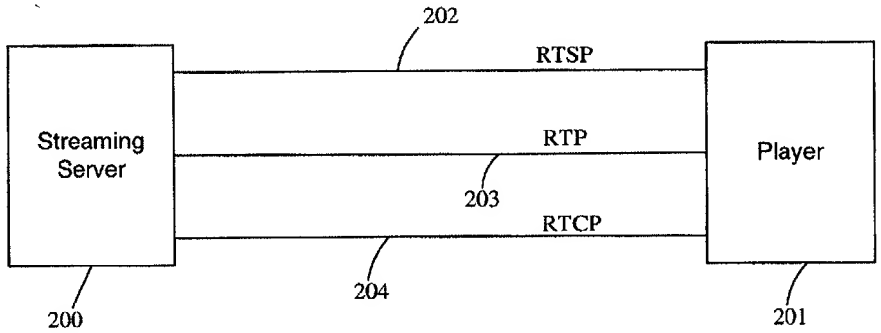


Figure 2

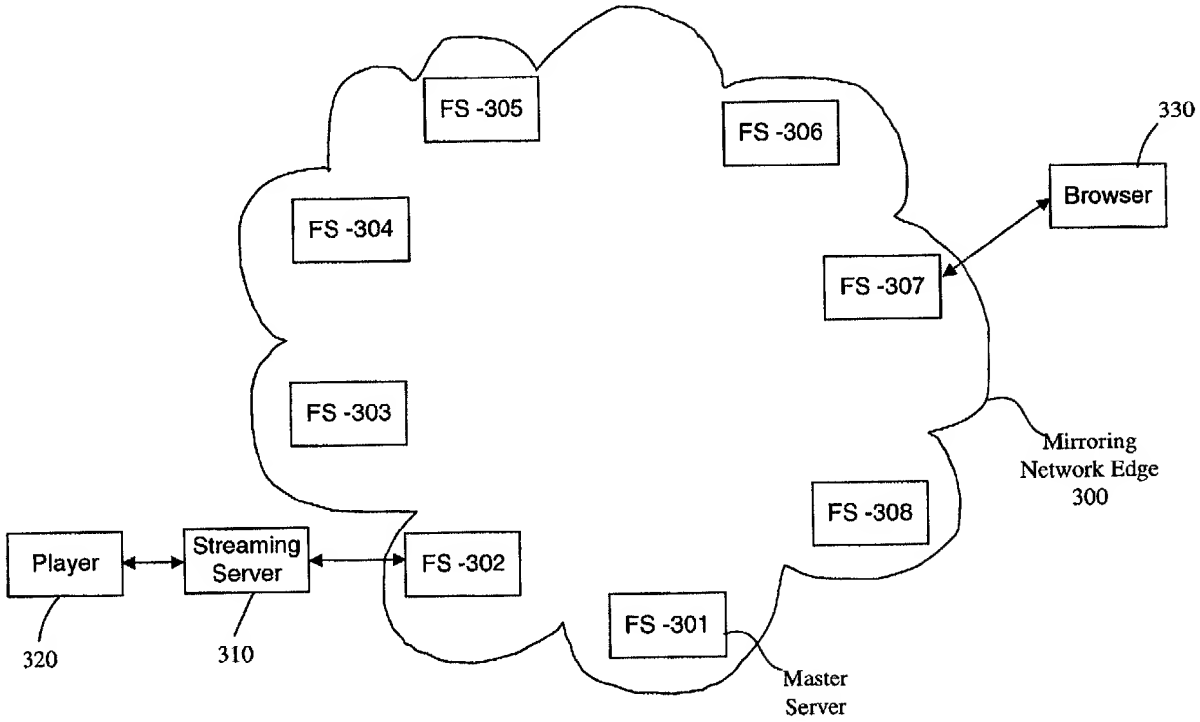


Figure 3

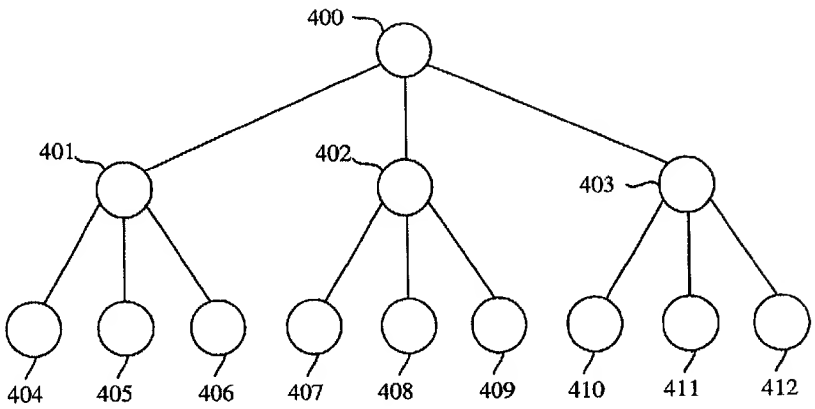


Figure 4

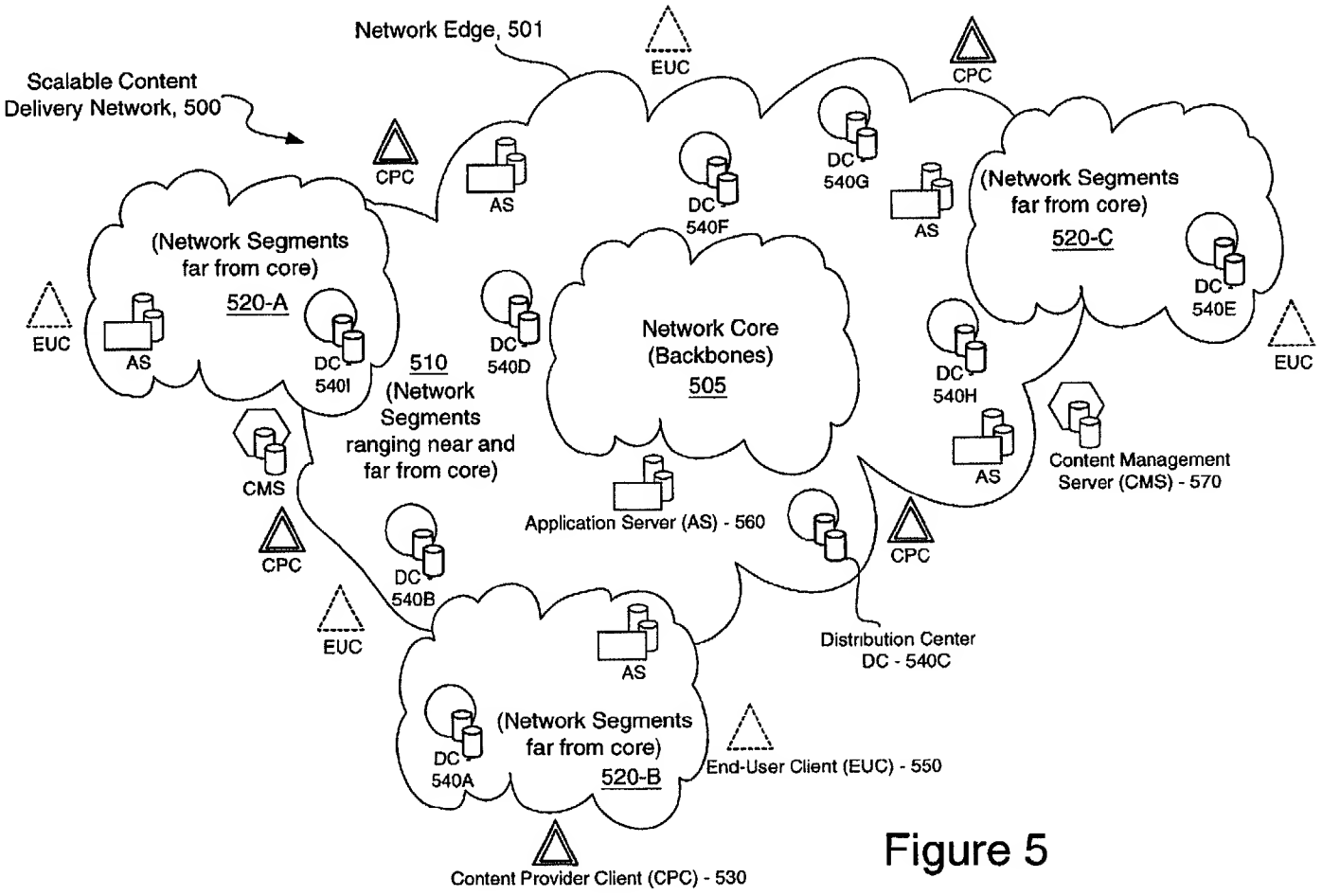

Network Edge, 501
Scalable Content Delivery Network, 500
EUC
CPC
AS
DC 540F
DC 540G
(Network Segments far from core)
520-C
DC 540E
(Network Segments far from core)
520-A
DC 540I
DC 540D
510 (Network Segments ranging near and far from core)
Network Core (Backbones) 505
DC 540H
CMS
Content Management Server (CMS) - 570
Application Server (AS) - 560
DC 540B
Distribution Center DC - 540C
(Network Segments far from core)
520-B
DC 540A
End-User Client (EUC) - 550
Content Provider Client (CPC) - 530

Figure 5

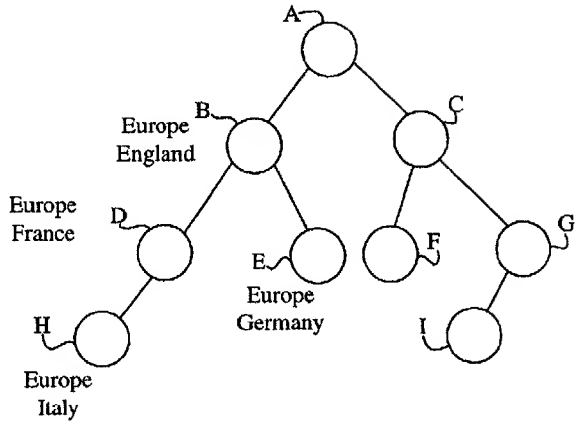


Figure 6

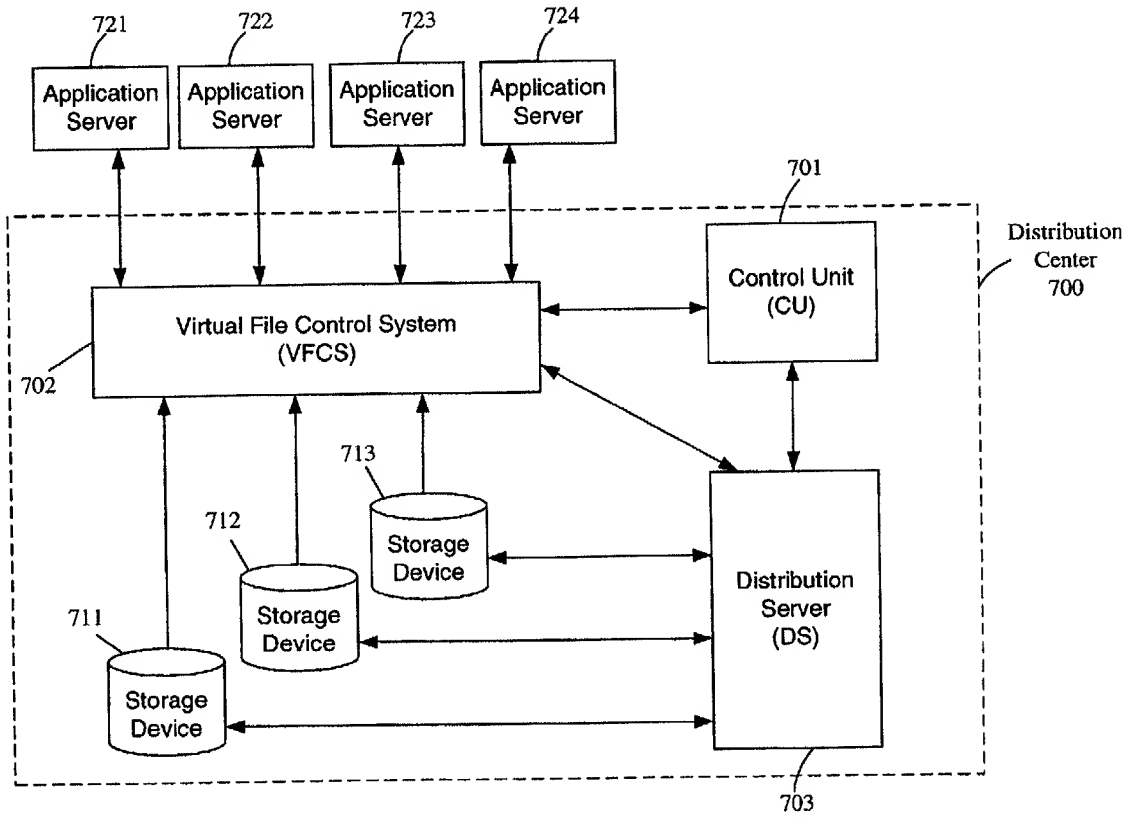

721
722
723
724
Application Server
Application Server
Application Server
Application Server
701
Distribution Center 700
Control Unit (CU)
Virtual File Control System (VFCS)
702
713
712
711
Storage Device
Storage Device
Storage Device
Distribution Server (DS)
703

Figure 7

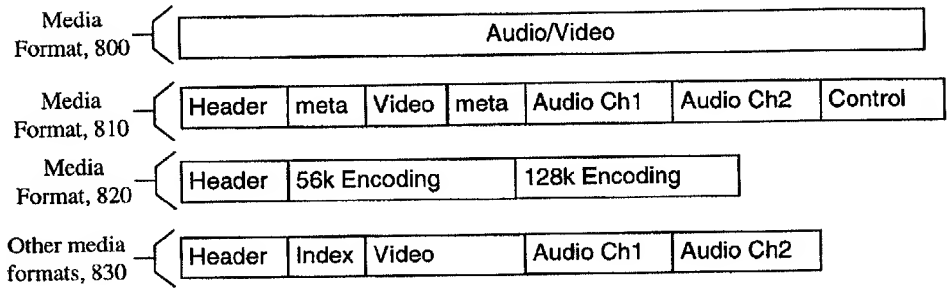


Figure 8

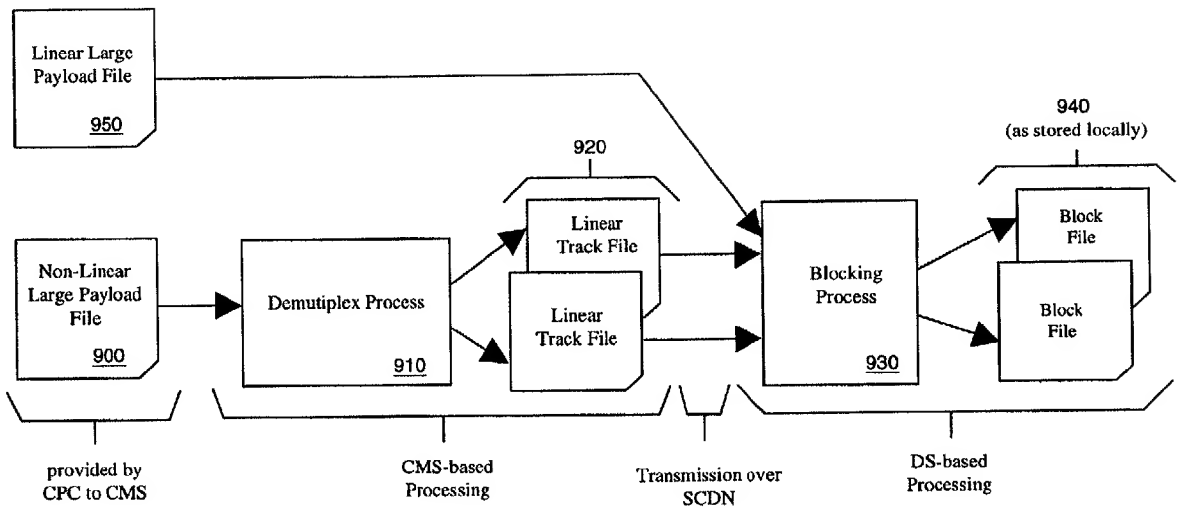

Linear Large Payload File
950
Non-Linear Large Payload File
900
Demutiplex Process
910
920
Linear Track File
Linear Track File
Blocking Process
930
940
(as stored locally)
Block File
Block File
provided by CPC to CMS
CMS-based Processing
Transmission over SCDN
DS-based Processing

Figure 9

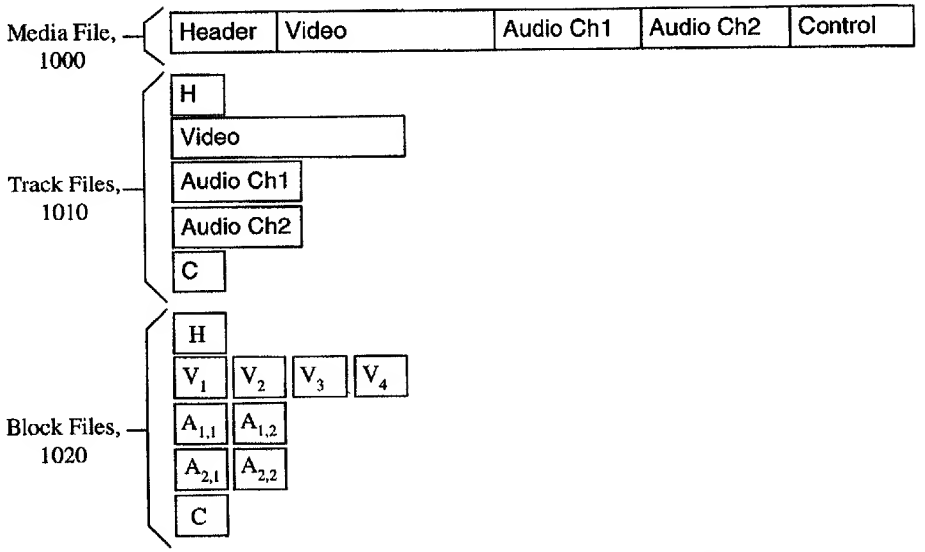


Figure 10

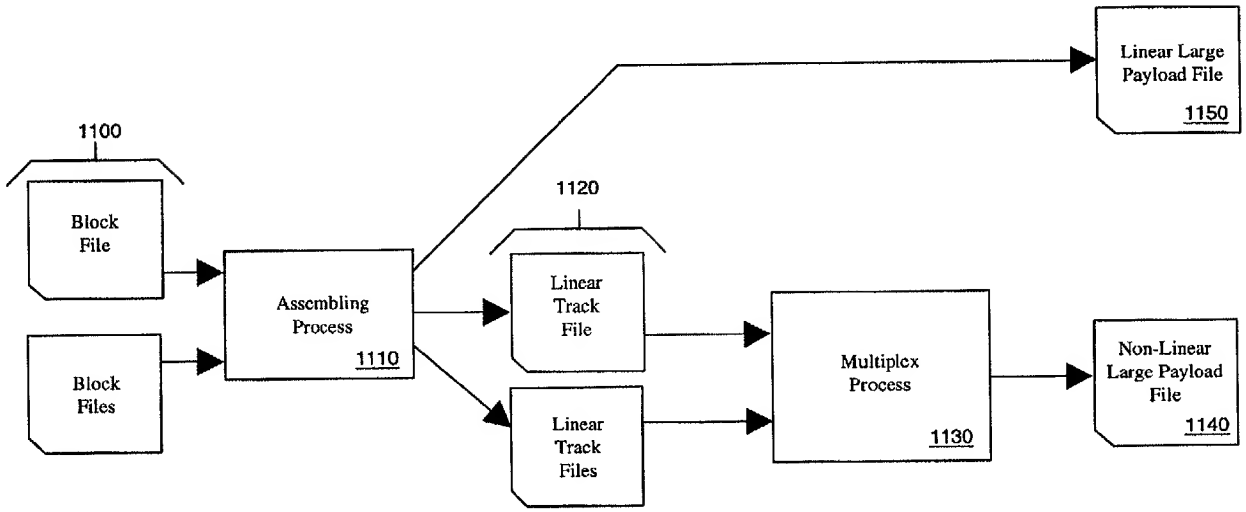


Figure 11

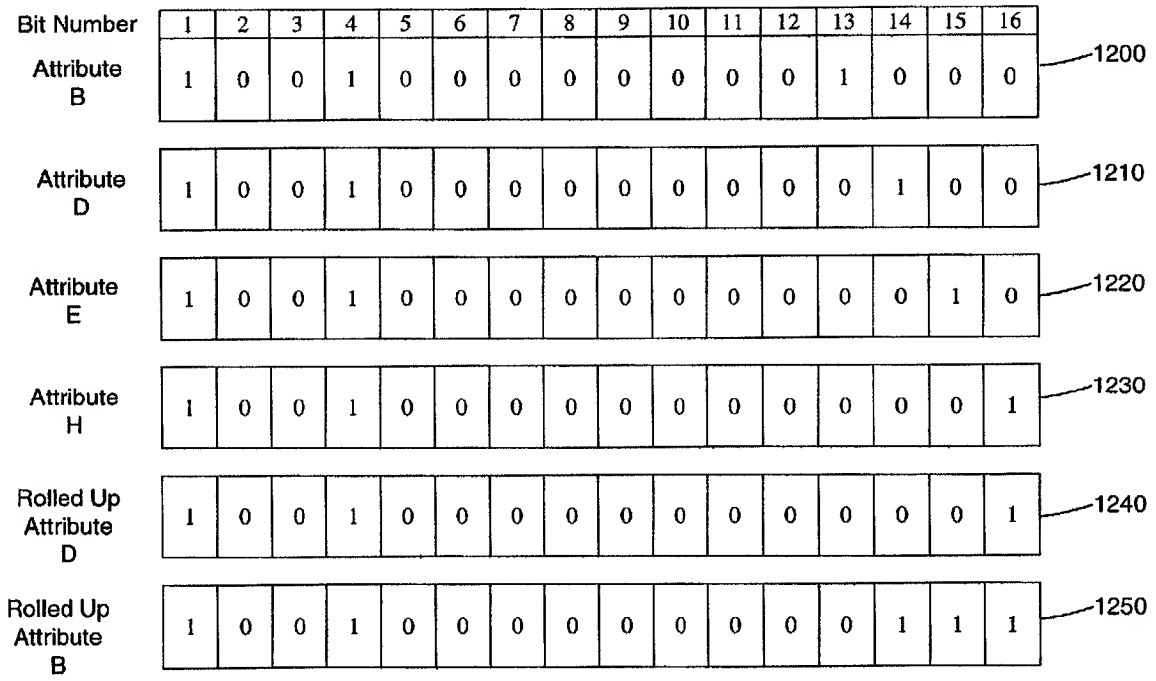

Bit Number
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Attribute B
1 0 0 1 0 0 0 0 0 0 0 0 1 0 0 0
1200
Attribute D
1 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0
1210
Attribute E
1 0 0 1 0 0 0 0 0 0 0 0 0 0 1 0
1220
Attribute H
1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 1
1230
Rolled Up Attribute D
1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 1
1240
Rolled Up Attribute B
1 0 0 1 0 0 0 0 0 0 0 0 0 1 1 1
1250

Figure 12

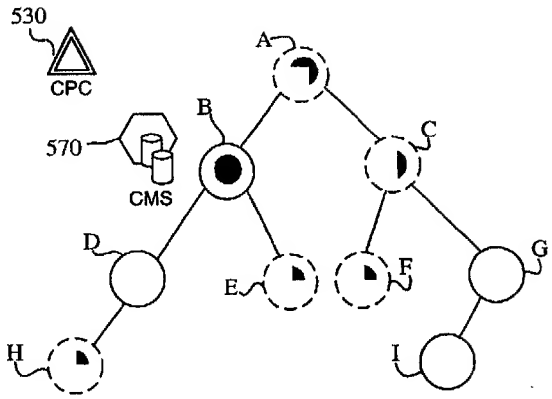


Figure 13

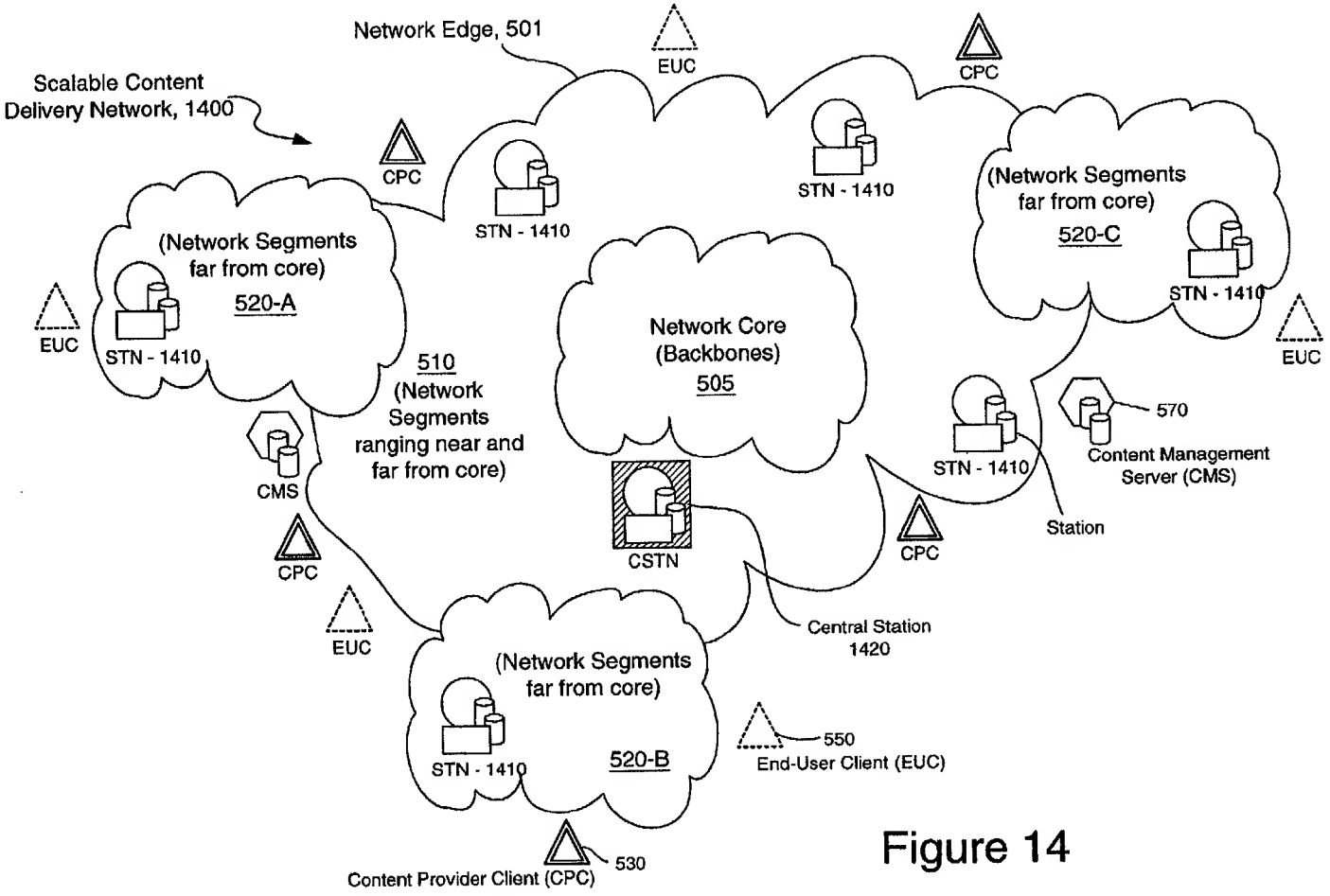

Network Edge, 501
Scalable Content Delivery Network, 1400
EUC
CPC
CPC
STN - 1410
STN - 1410
(Network Segments far from core)
520-C
STN - 1410
EUC
(Network Segments far from core)
520-A
EUC
STN - 1410
510
(Network Segments ranging near and far from core)
Network Core (Backbones)
505
CMS
CPC
CSTN
STN - 1410
570
Content Management Server (CMS)
Station
CPC
EUC
Central Station 1420
(Network Segments far from core)
520-B
STN - 1410
550
End-User Client (EUC)
530
Content Provider Client (CPC)

Figure 14

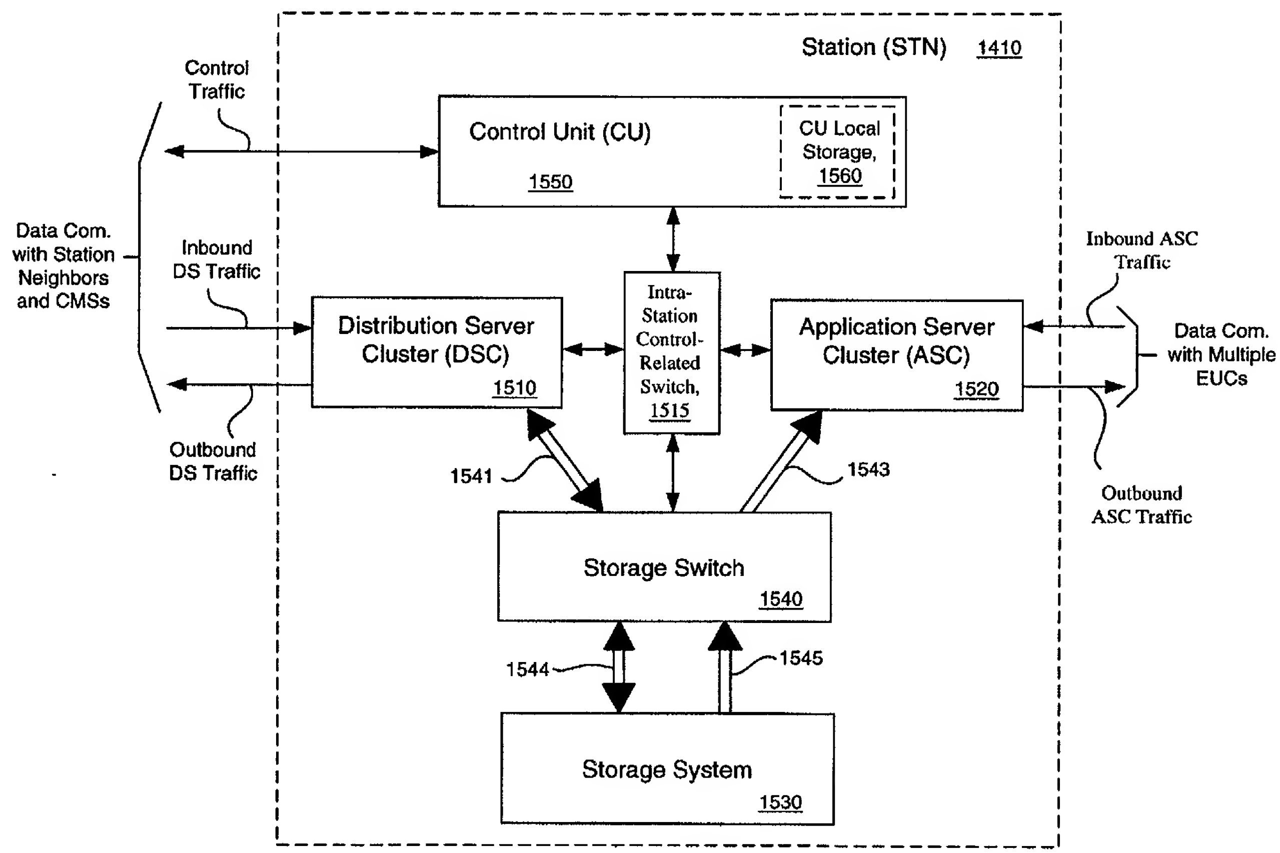

Station (STN) 1410
Control Unit (CU)
1550
CU Local Storage, 1560
Control Traffic
Data Com. with Station Neighbors and CMSs
Inbound DS Traffic
Outbound DS Traffic
Distribution Server Cluster (DSC)
1510
Intra-Station Control-Related Switch, 1515
Application Server Cluster (ASC)
1520
Inbound ASC Traffic
Data Com. with Multiple EUCs
Outbound ASC Traffic
1541
1543
Storage Switch
1540
1544
1545
Storage System
1530

Figure 15

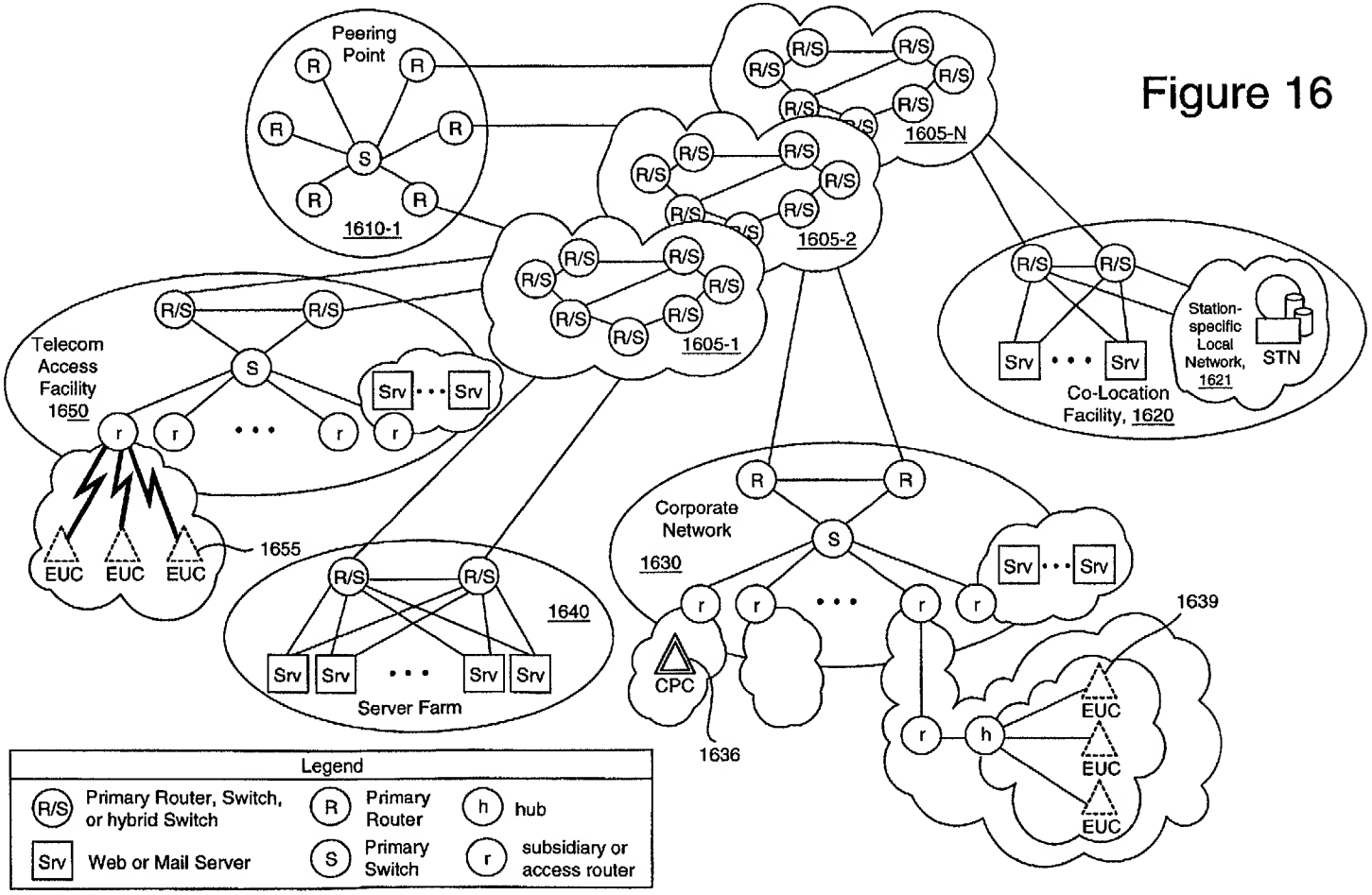

Peering Point
1610-1
1605-N
1605-2
1605-1
Telecom Access Facility 1650
EUC
1655
Server Farm
1640
Corporate Network
1630
CPC
1636
1639
Station-specific Local Network, 1621
STN
Co-Location Facility, 1620
Legend
Primary Router, Switch, or hybrid Switch
Primary Router
hub
Web or Mail Server
Primary Switch
subsidiary or access router

Figure 16

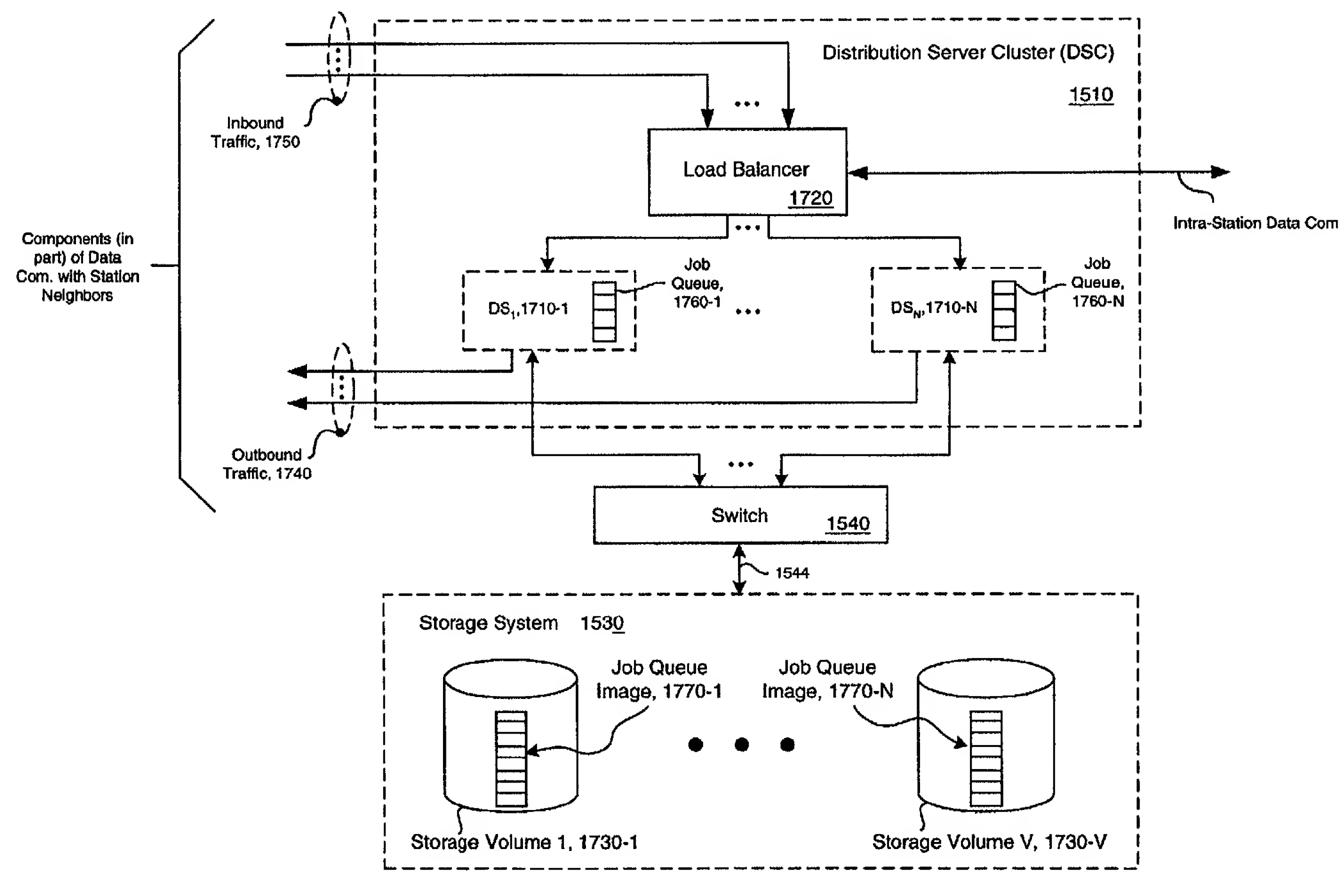

Distribution Server Cluster (DSC)
1510
Inbound Traffic, 1750
Load Balancer
1720
Intra-Station Data Com
Components (in part) of Data Com. with Station Neighbors
DS_1,1710-1
Job Queue, 1760-1
DS_N,1710-N
Job Queue, 1760-N
Outbound Traffic, 1740
Switch
1540
1544
Storage System 1530
Job Queue Image, 1770-1
Job Queue Image, 1770-N
Storage Volume 1, 1730-1
Storage Volume V, 1730-V

Figure 17

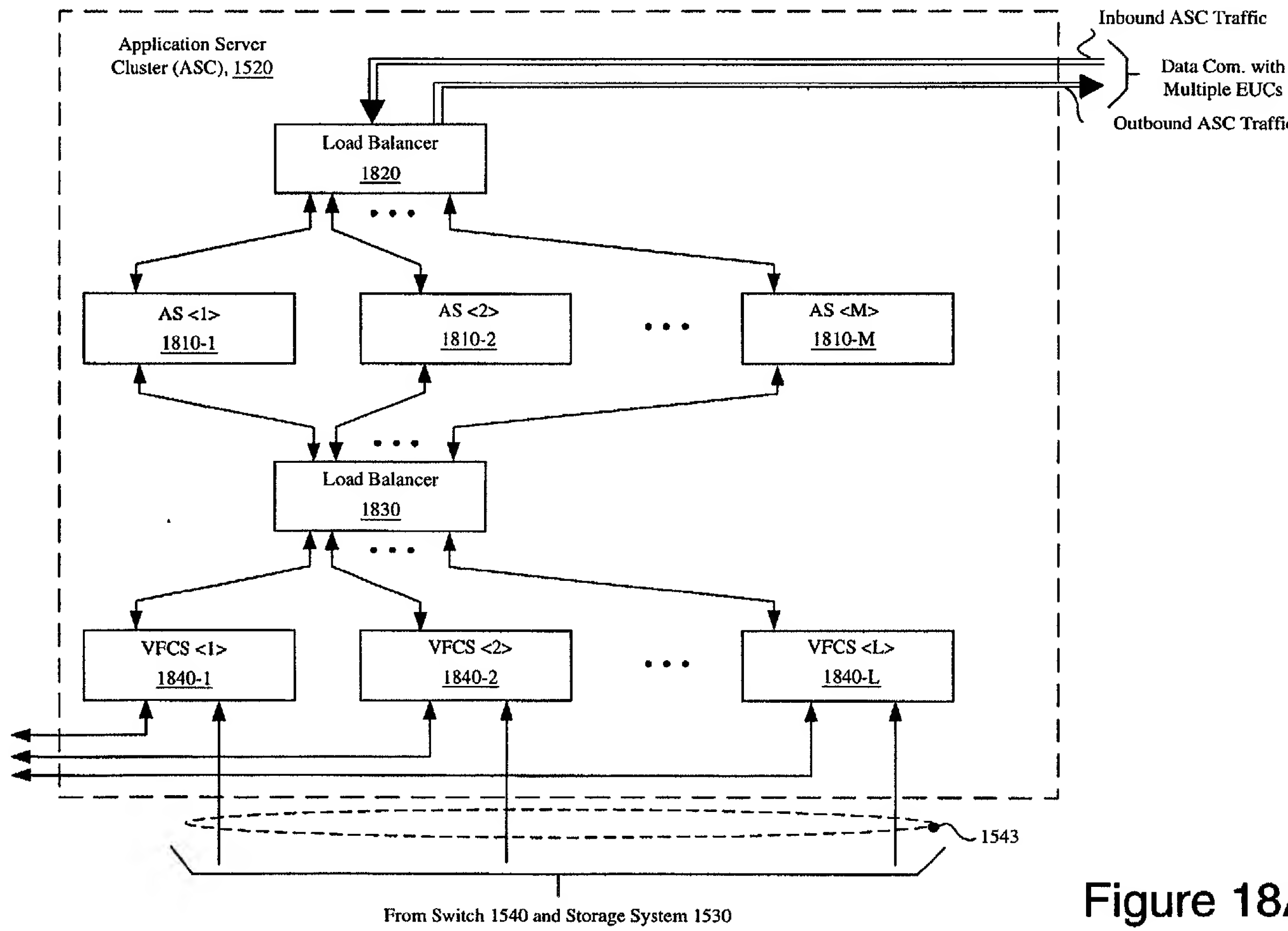

Application Server
Cluster (ASC), 1520
Inbound ASC Traffic
Data Com. with
Multiple EUCs
Outbound ASC Traffic
Load Balancer
1820
AS <1>
1810-1
AS <2>
1810-2
AS <M>
1810-M
Load Balancer
1830
VFCS <1>
1840-1
VFCS <2>
1840-2
VFCS <L>
1840-L
1543
From Switch 1540 and Storage System 1530

Figure 18A

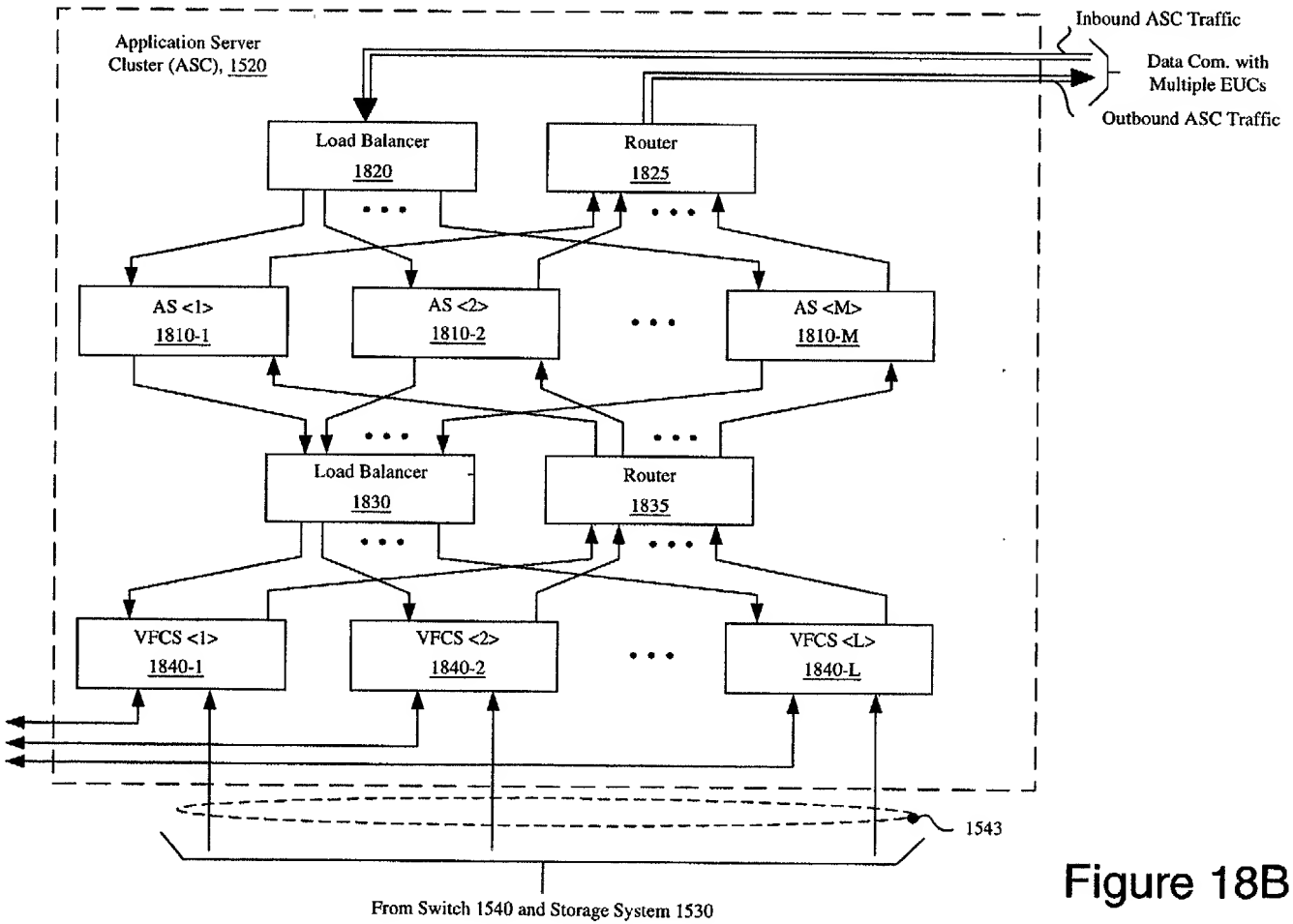


Figure 18B

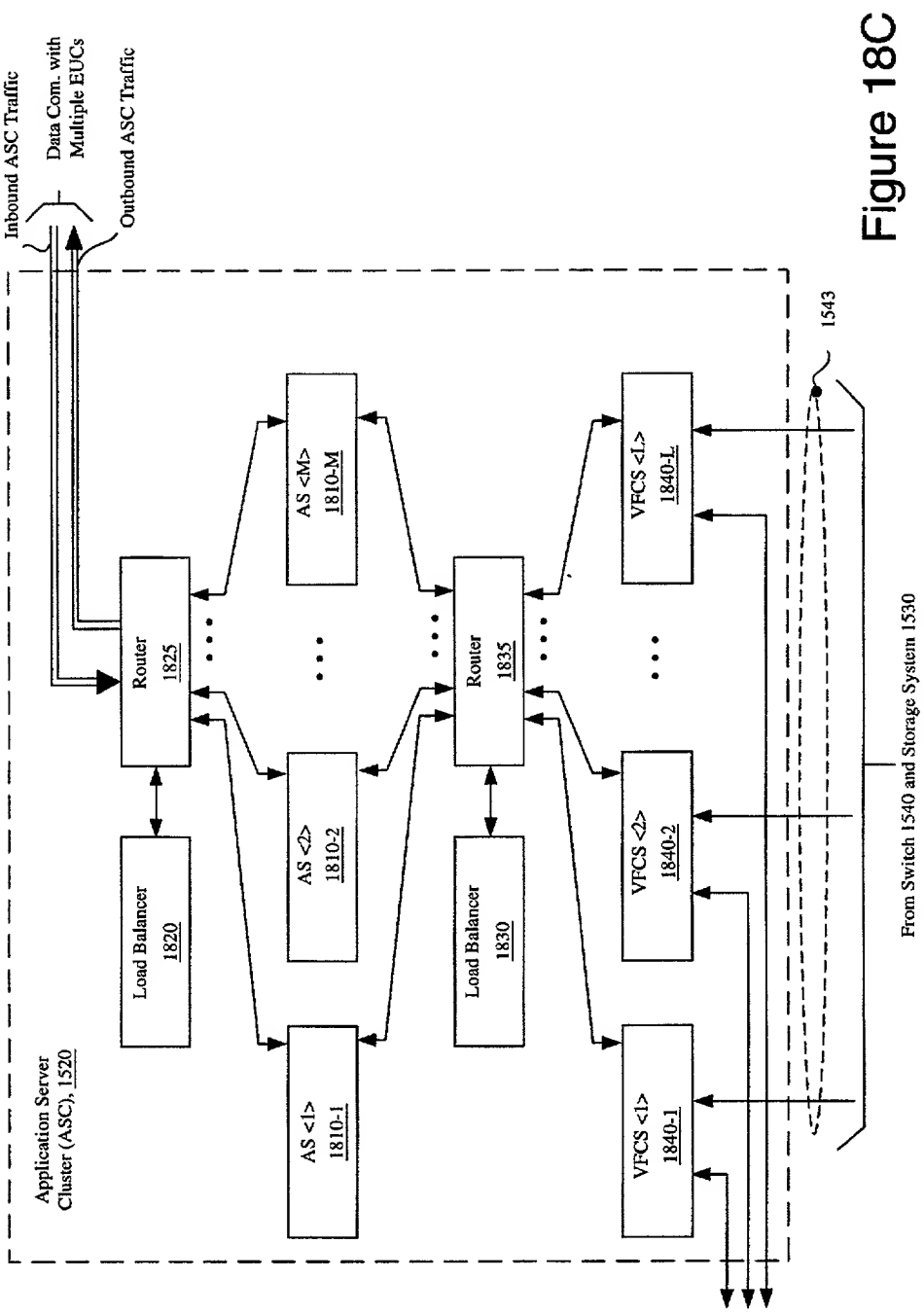

Inbound ASC Traffic
Data Com. with Multiple EUCs
Outbound ASC Traffic
Application Server Cluster (ASC), 1520
Load Balancer 1820
Router 1825
AS <1> 1810-1
AS <2> 1810-2
AS <M> 1810-M
Load Balancer 1830
Router 1835
VFCS <1> 1840-1
VFCS <2> 1840-2
VFCS <L> 1840-L
1543
From Switch 1540 and Storage System 1530

Figure 18C

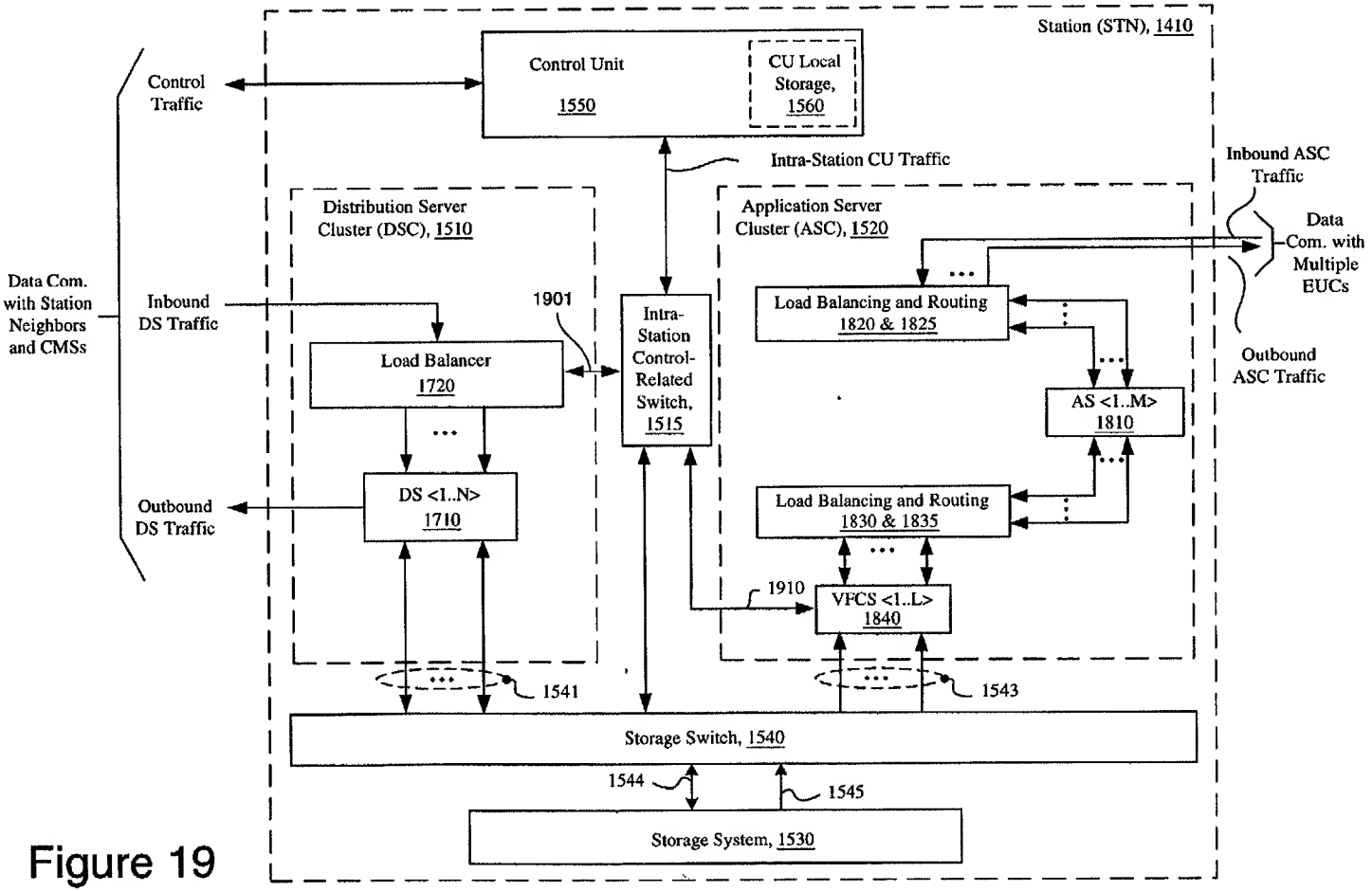

Station (STN), 1410
Control Unit
1550
CU Local Storage, 1560
Control Traffic
Intra-Station CU Traffic
Inbound ASC Traffic
Data Com. with Multiple EUCs
Outbound ASC Traffic
Distribution Server Cluster (DSC), 1510
Application Server Cluster (ASC), 1520
Data Com. with Station Neighbors and CMSs
Inbound DS Traffic
1901
Intra-Station Control-Related Switch, 1515
Load Balancing and Routing 1820 & 1825
Load Balancer 1720
AS <1..M> 1810
DS <1..N> 1710
Outbound DS Traffic
Load Balancing and Routing 1830 & 1835
1910
VFCS <1..L> 1840
1541
1543
Storage Switch, 1540
1544
1545
Storage System, 1530

Figure 19

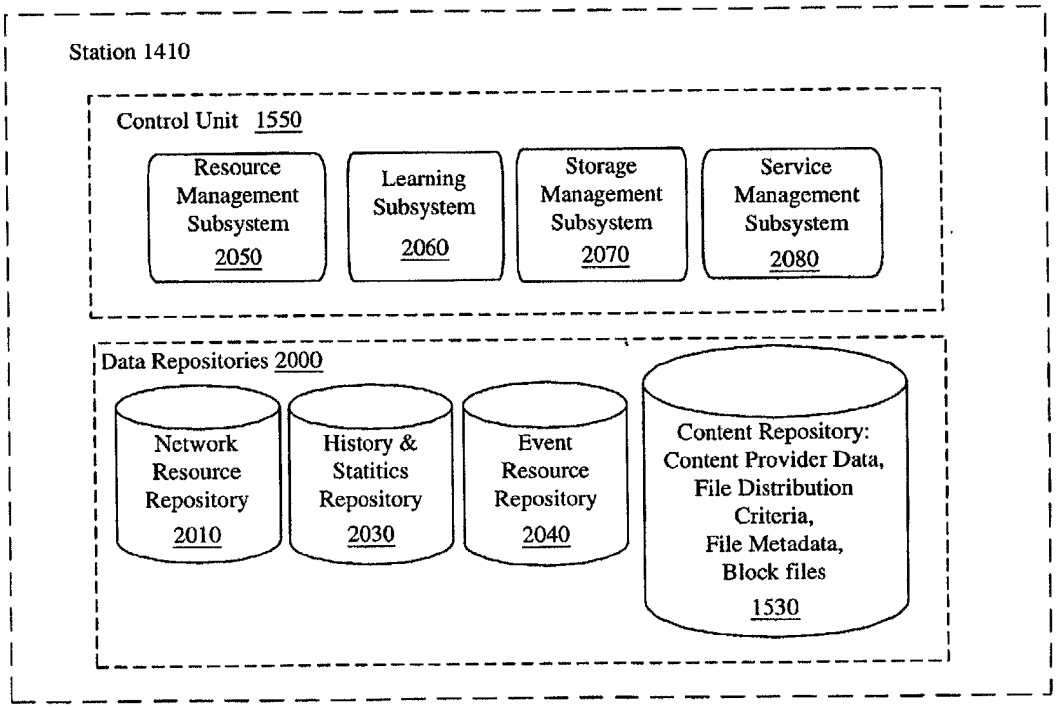

Station 1410
Control Unit 1550
Resource Management Subsystem 2050
Learning Subsystem 2060
Storage Management Subsystem 2070
Service Management Subsystem 2080
Data Repositories 2000
Network Resource Repository 2010
History & Statitics Repository 2030
Event Resource Repository 2040
Content Repository: Content Provider Data, File Distribution Criteria, File Metadata, Block files 1530

Figure 20

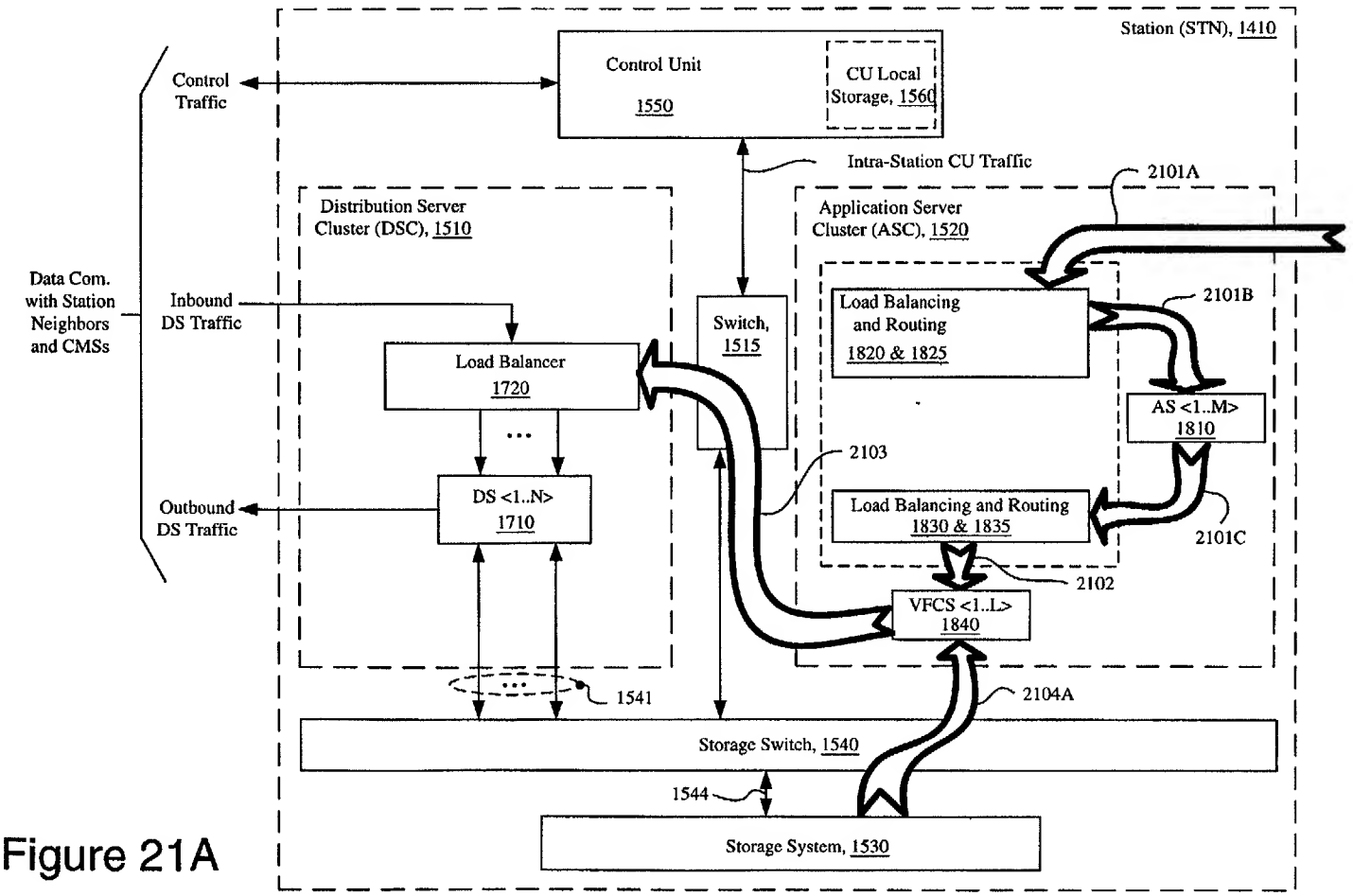

Station (STN), 1410
Control Traffic
Control Unit
1550
CU Local Storage, 1560
Intra-Station CU Traffic
2101A
Distribution Server Cluster (DSC), 1510
Application Server Cluster (ASC), 1520
Data Com. with Station Neighbors and CMSs
Inbound DS Traffic
Switch, 1515
Load Balancing and Routing
1820 & 1825
2101B
Load Balancer
1720
AS <1..M>
1810
2103
DS <1..N>
1710
Outbound DS Traffic
Load Balancing and Routing
1830 & 1835
2101C
2102
VFCS <1..L>
1840
1541
2104A
Storage Switch, 1540
1544
Storage System, 1530

Figure 21A

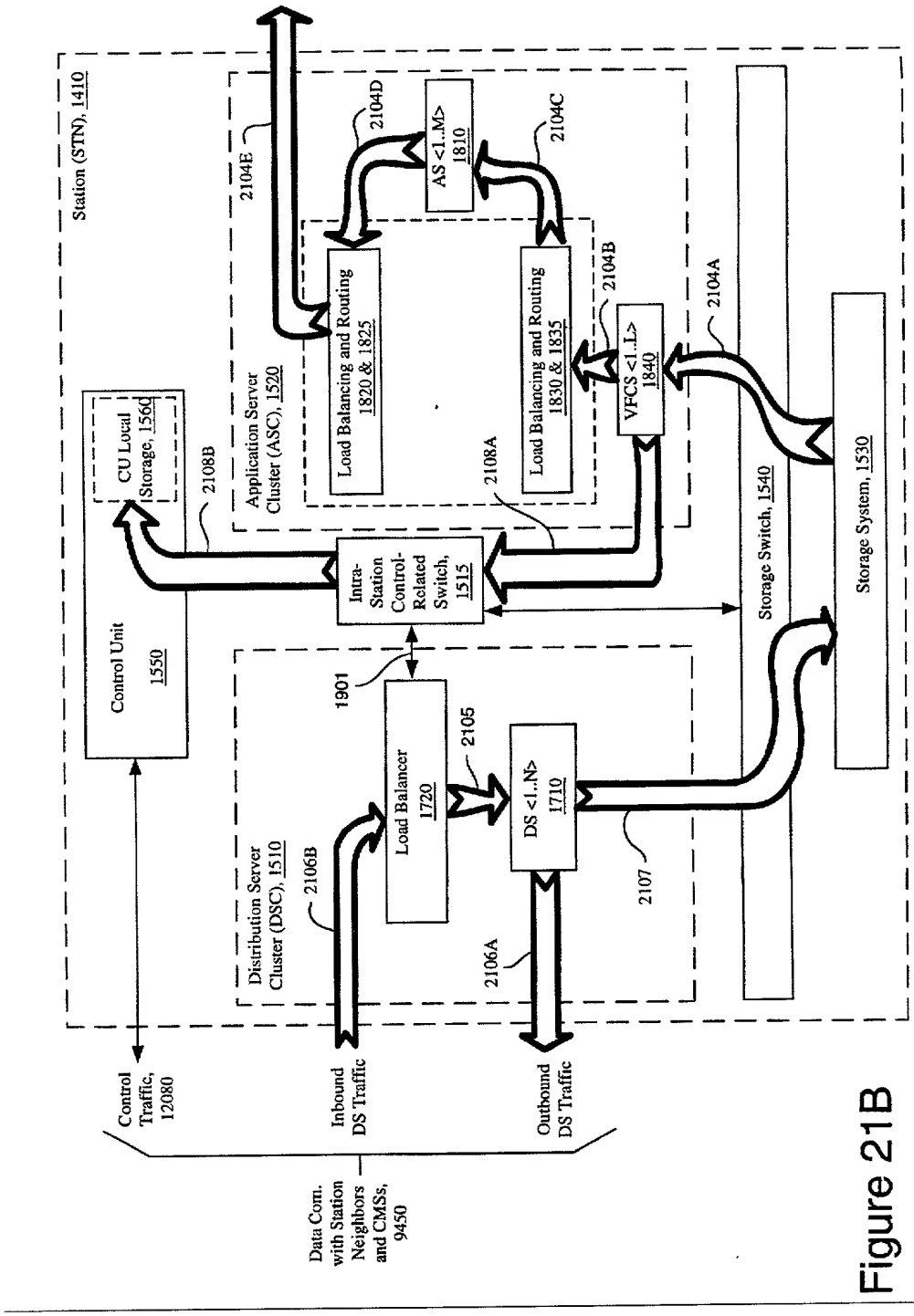

Station (STN), 1410
Application Server Cluster (ASC), 1520
Load Balancing and Routing 1820 & 1825
AS <1..M> 1810
Load Balancing and Routing 1830 & 1835
VFCS <1..L> 1840
Intra-Station Control-Related Switch, 1515
CU Local Storage, 1560
Control Unit 1550
Distribution Server Cluster (DSC), 1510
Load Balancer 1720
DS <1..N> 1710
Storage Switch, 1540
Storage System, 1530
2104A
2104B
2104C
2104D
2104E
2108A
2108B
1901
2105
2106A
2106B
2107
Control Traffic, 12080
Inbound DS Traffic
Outbound DS Traffic
Data Com. with Station Neighbors and CMSs, 9450

Figure 21B

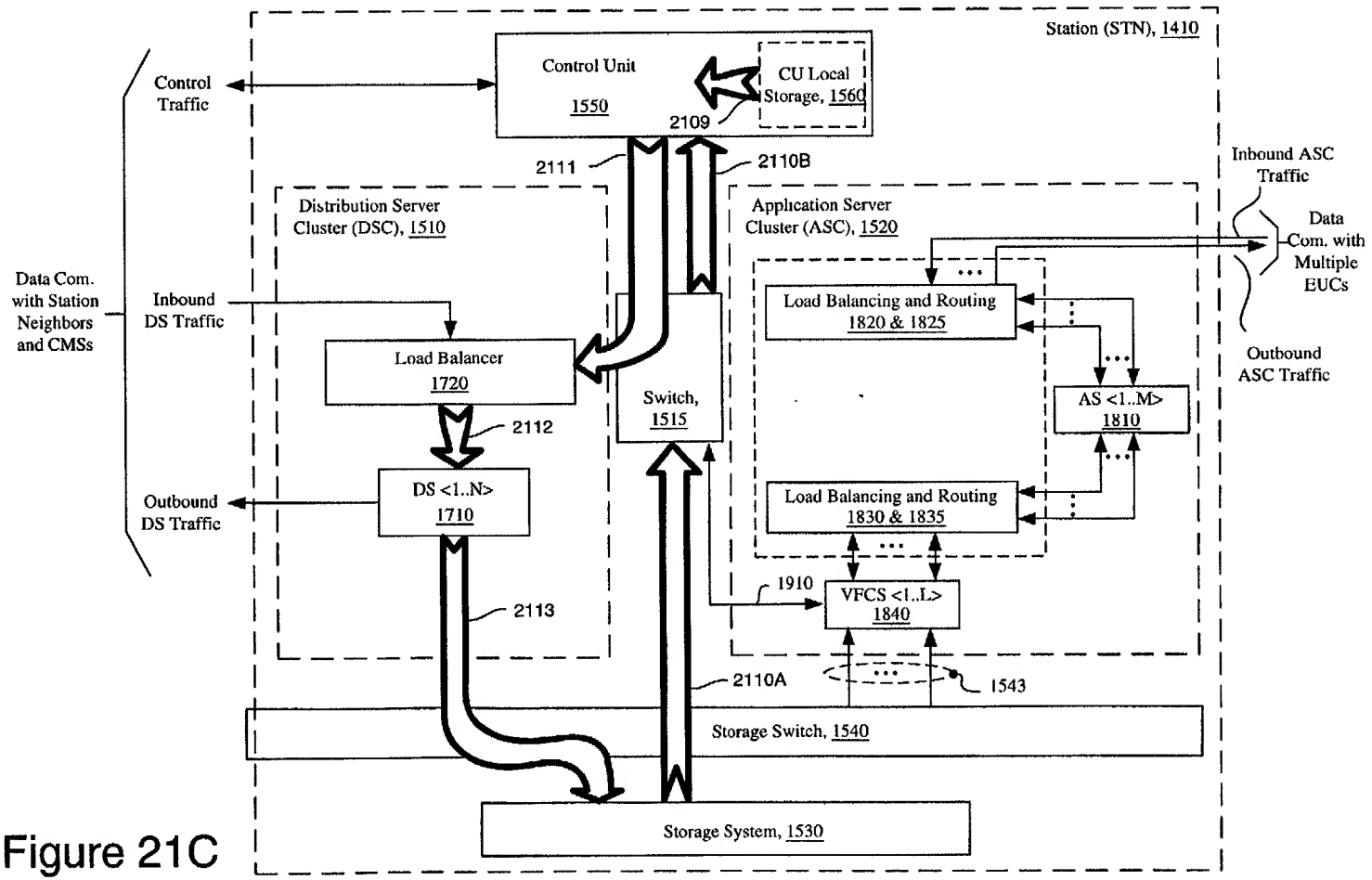

Station (STN), 1410
Control Unit
1550
CU Local Storage, 1560
2109
Control Traffic
2111
2110B
Inbound ASC Traffic
Data Com. with Multiple EUCs
Outbound ASC Traffic
Distribution Server Cluster (DSC), 1510
Application Server Cluster (ASC), 1520
Data Com. with Station Neighbors and CMSs
Inbound DS Traffic
Load Balancing and Routing 1820 & 1825
Load Balancer 1720
Switch, 1515
AS <1..M> 1810
2112
Outbound DS Traffic
DS <1..N> 1710
Load Balancing and Routing 1830 & 1835
1910
VFCS <1..L> 1840
2113
2110A
1543
Storage Switch, 1540
Storage System, 1530

Figure 21C

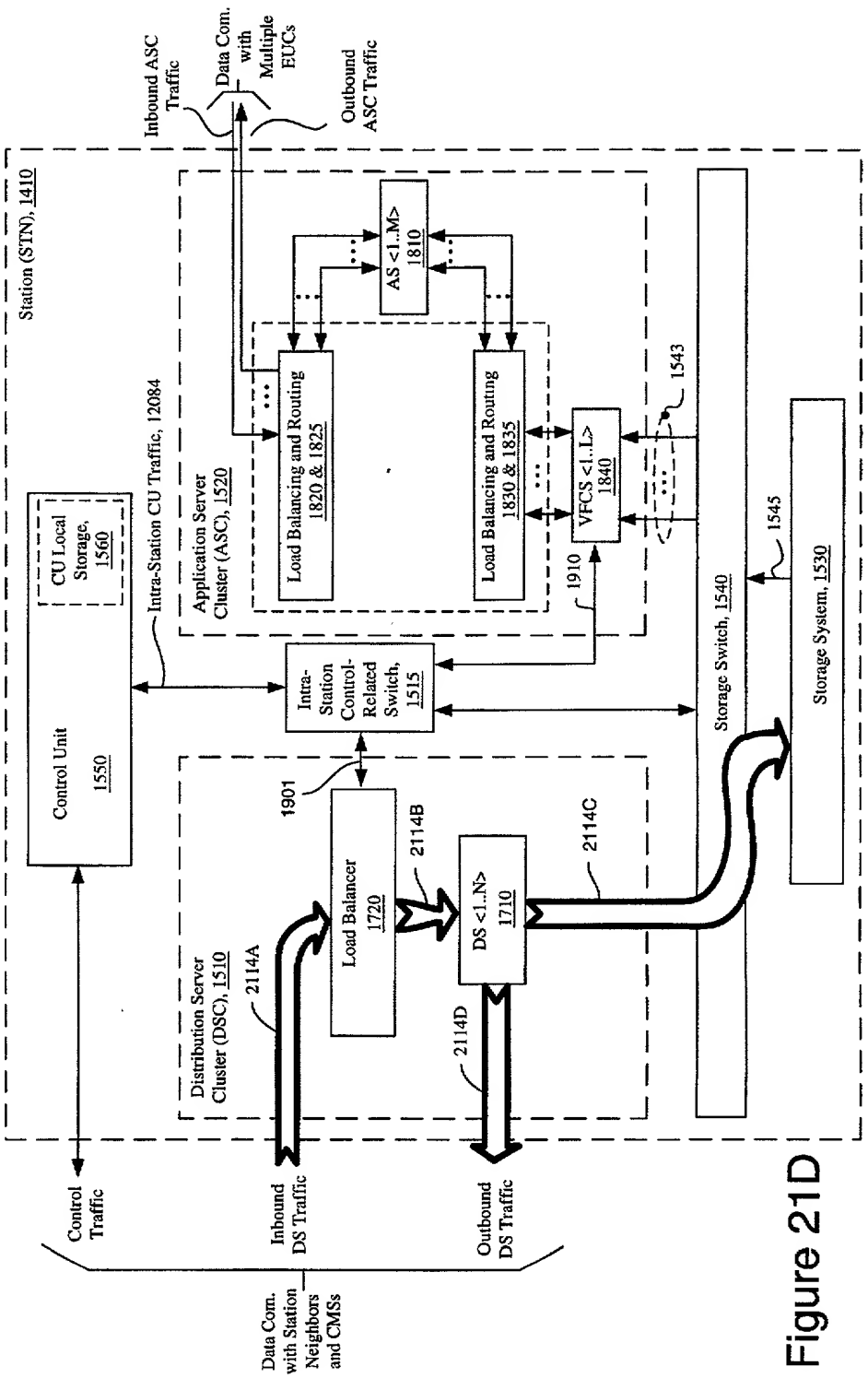

Station (STN), 1410
Inbound ASC Traffic
Data Com. with Multiple EUCs
Outbound ASC Traffic
Control Unit 1550
CU Local Storage, 1560
Intra-Station CU Traffic, 12084
Application Server Cluster (ASC), 1520
AS <1..M> 1810
Load Balancing and Routing 1820 & 1825
Load Balancing and Routing 1830 & 1835
VFCS <1..L> 1840
1543
1545
1910
Intra-Station Control-Related Switch, 1515
Storage Switch, 1540
Storage System, 1530
1901
Distribution Server Cluster (DSC), 1510
Load Balancer 1720
DS <1..N> 1710
2114A
2114B
2114C
2114D
Control Traffic
Inbound DS Traffic
Outbound DS Traffic
Data Com. with Station Neighbors and CMSs

Figure 21D

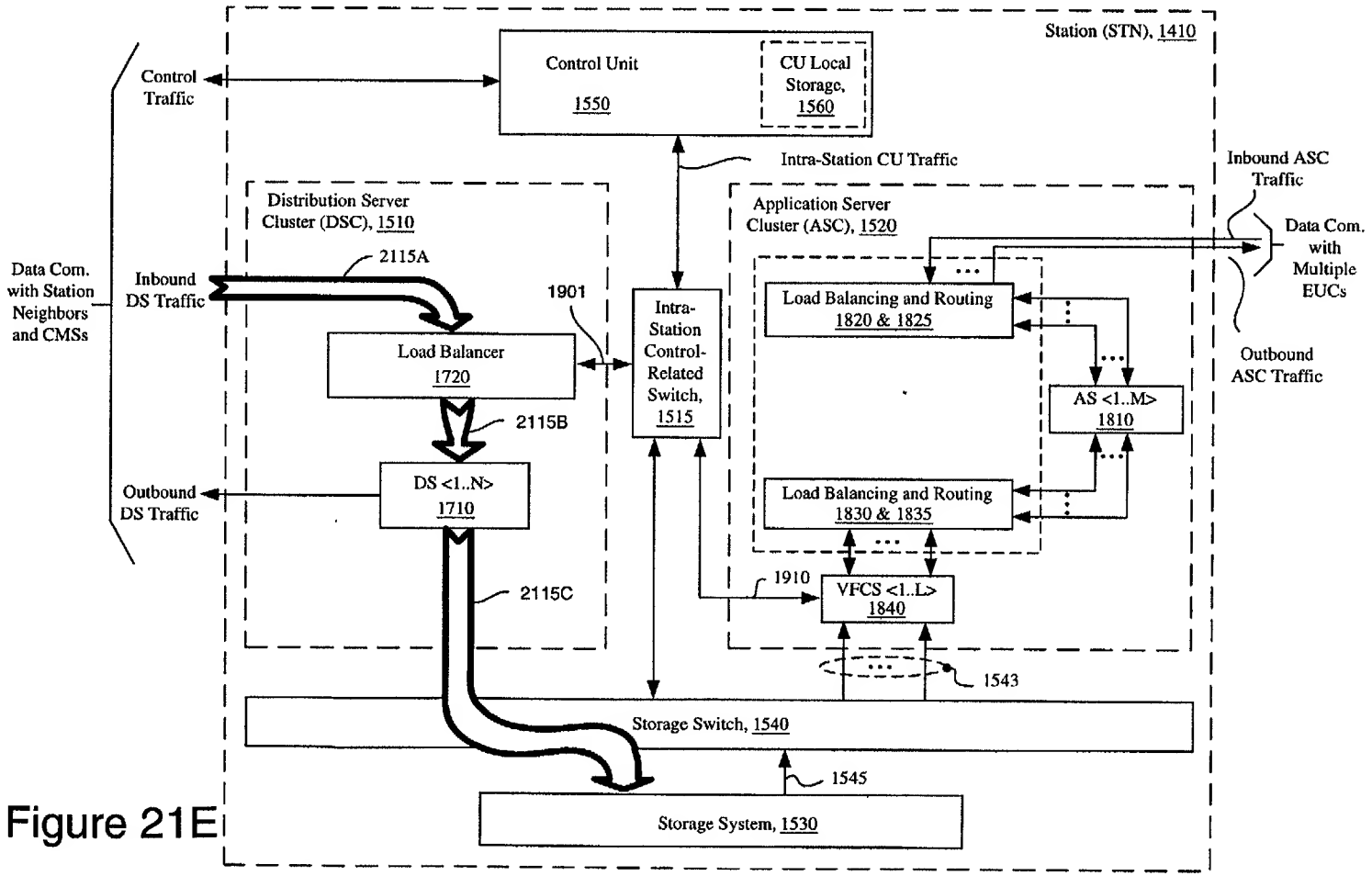


Figure 21E

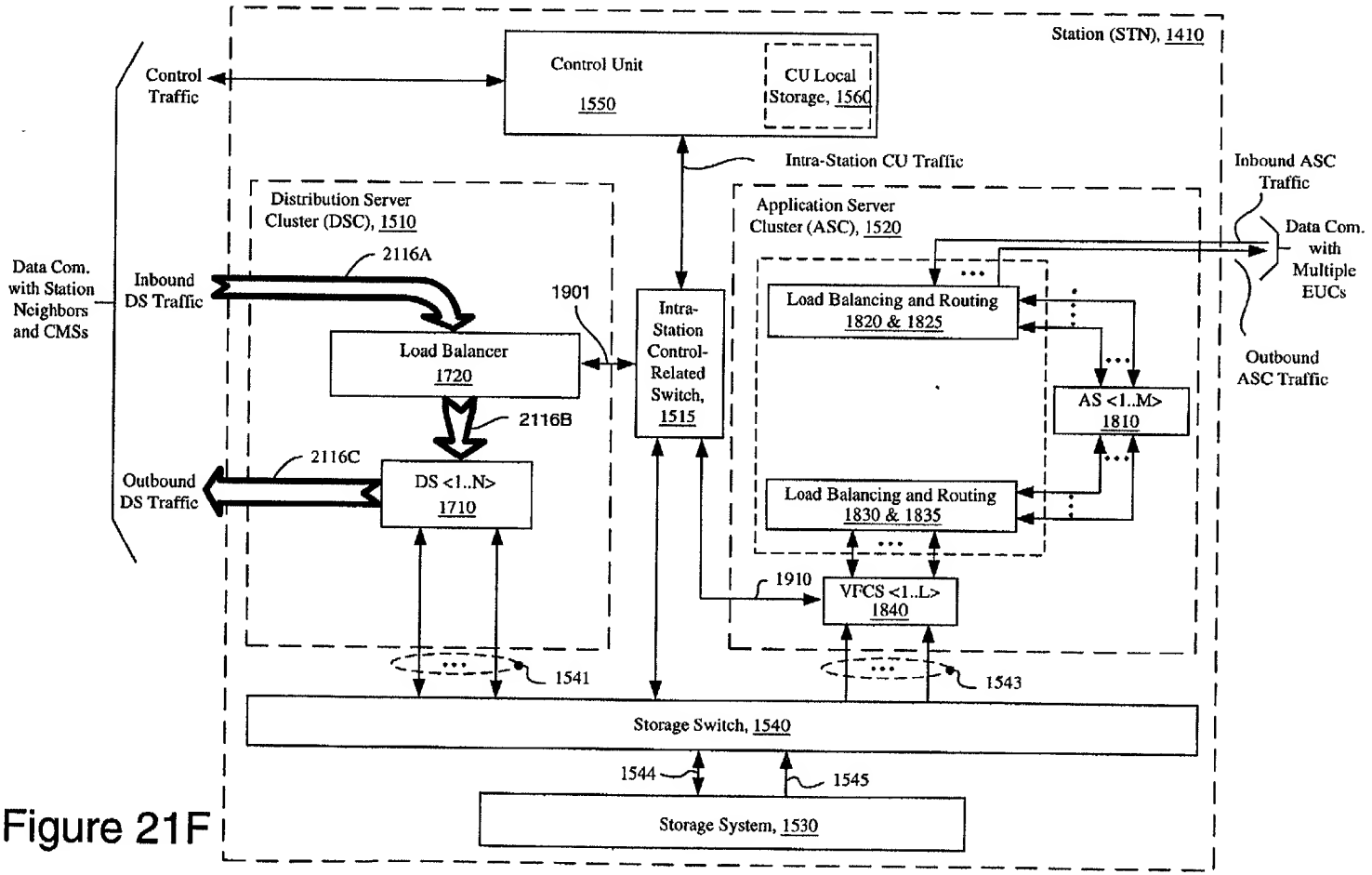


Figure 21F

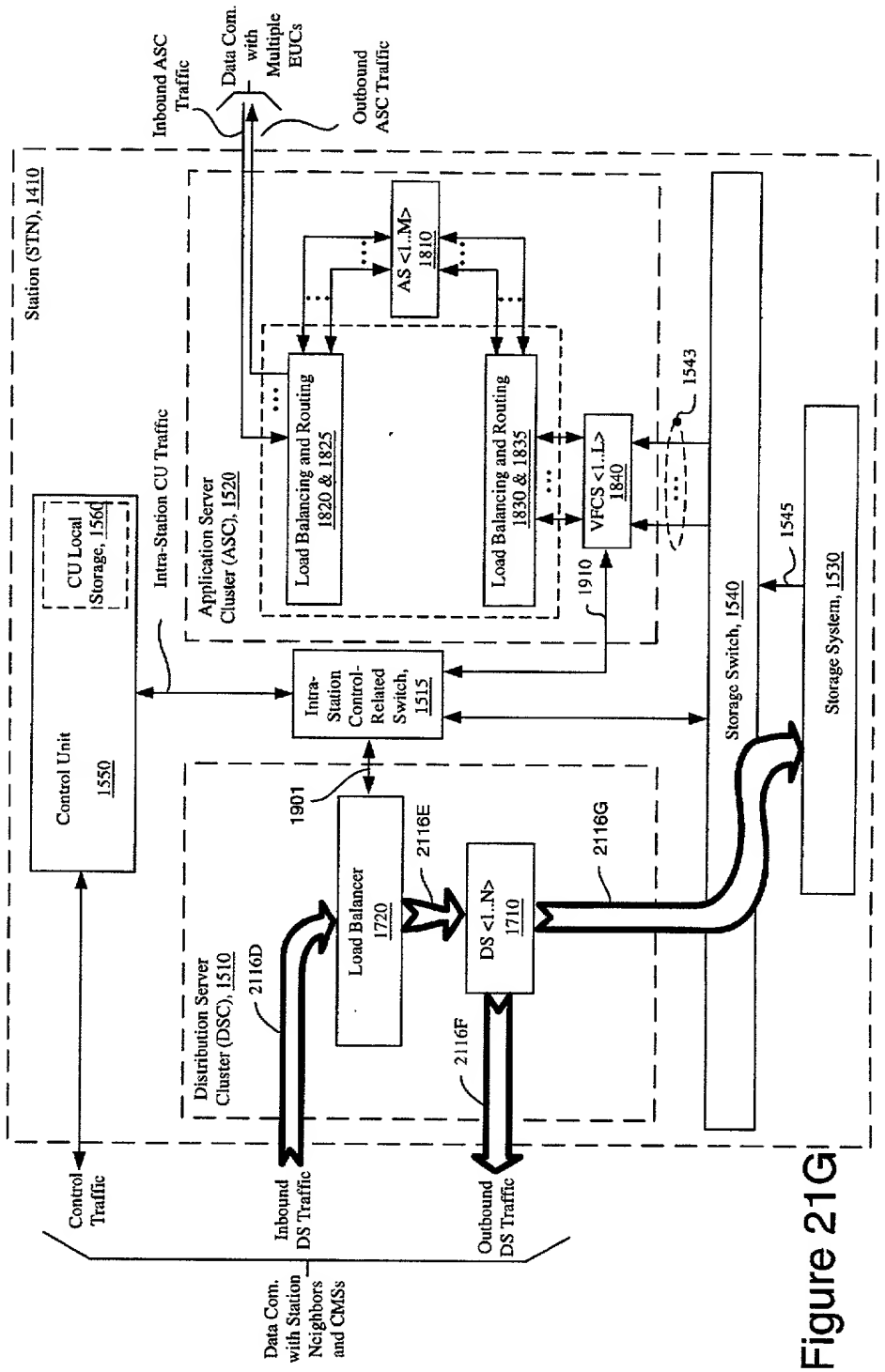

Station (STN), 1410
Inbound ASC Traffic
Data Com. with Multiple EUCs
Outbound ASC Traffic
Intra-Station CU Traffic
Application Server Cluster (ASC), 1520
Load Balancing and Routing 1820 & 1825
AS <1..M> 1810
Load Balancing and Routing 1830 & 1835
VFCS <1..L> 1840
1543
1910
CU Local Storage, 1560
Control Unit 1550
Intra-Station Control-Related Switch, 1515
Storage Switch, 1540
1545
Storage System, 1530
1901
2116E
2116G
Distribution Server Cluster (DSC), 1510
2116D
Load Balancer 1720
DS <1..N> 1710
2116F
Control Traffic
Inbound DS Traffic
Outbound DS Traffic
Data Com. with Station Neighbors and CMSs

Figure 21G

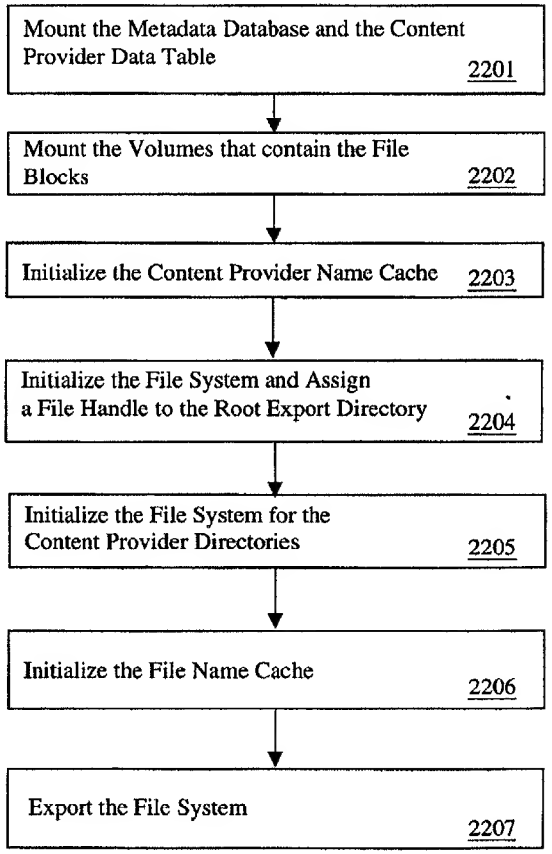


Figure 22

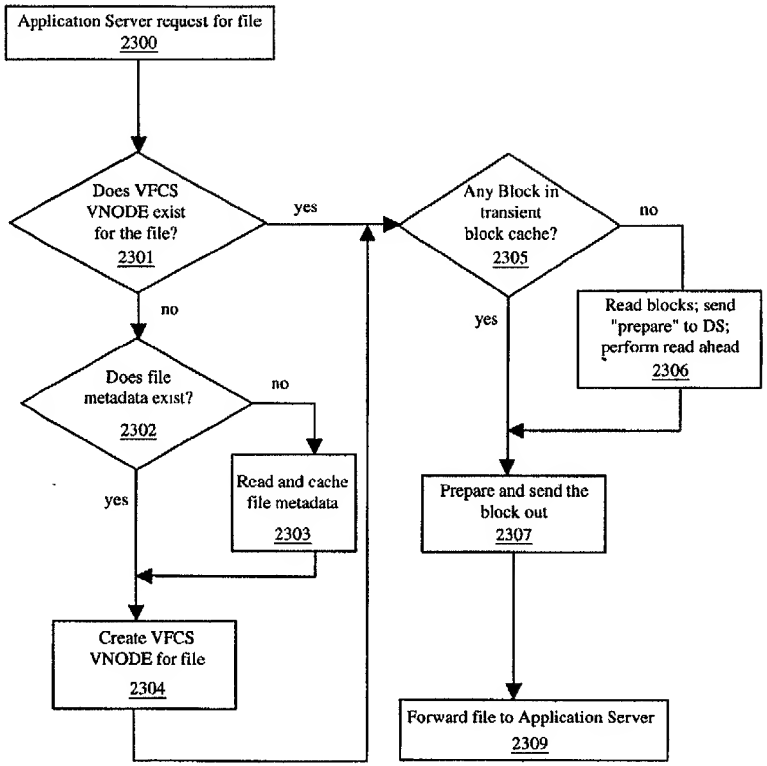
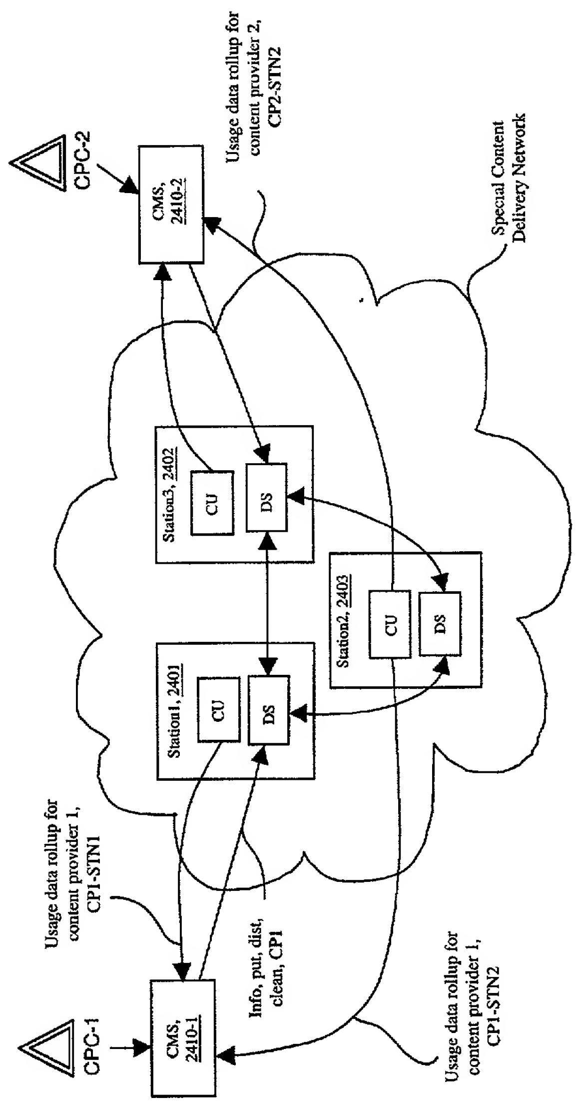

Application Server request for file
2300
Does VFCS VNODE exist for the file?
2301
yes
no
Any Block in transient block cache?
2305
no
yes
Read blocks; send "prepare" to DS; perform read ahead
2306
Does file metadata exist?
2302
no
yes
Read and cache file metadata
2303
Prepare and send the block out
2307
Create VFCS VNODE for file
2304
Forward file to Application Server
2309

Figure 23



CPC-1
CMS, 2410-1
CPC-2
CMS, 2410-2
Usage data rollup for content provider 1, CP1-STN1
Info, put, dist, clean, CP1
Usage data rollup for content provider 1, CP1-STN2
Usage data rollup for content provider 2, CP2-STN2
Station1, 2401
CU
DS
Station3, 2402
CU
DS
Station2, 2403
CU
DS
Special Content Delivery Network

Figure 24

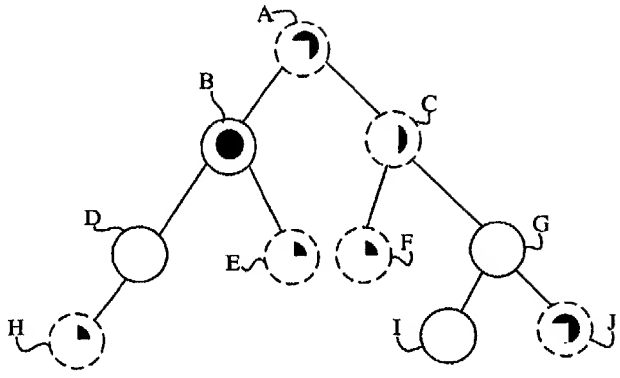


Figure 25